

REMARKS

In the above identified office action the Examiner has rejected claims 1 through 12 under 35 USC §103(a) for being unpatentable over Giffin, III et al (U.S. Patent No. 4,809,498) in view of Meauze (U.S. Patent No. 3,993,414). The Examiner has taken the position that Giffin, III et al discloses a gas turbine with counter-rotating first and second rotating blades but does not teach boundary layer removal. The Examiner then relies upon the teaching of Meauze et al to suggest that provision of a means for removing the boundary layer is old and well-known in the art.

The Examiner has misconstrued, the teachings of the references with respect to the claims of the present application. A review of Figure 1 of Giffin III et al in connection with the comments herein will make clear to one of skill in the art what Giffin, III et al does and does not teach. Giffin, III et al is directed specifically to counter rotation without intermediate stators.. This teaching is directed specifically to turbines. There is no teaching, disclosure or even a suggestion that counter rotation within the compressor could provide specific advantages with respect to certain parameters, as taught in the present invention. More specifically, referring back to Figure 1 of the patent, if Giffin, III et al had any understanding of the advantages that might be gained from the use of counter rotation in the compressor, they would have placed counter-rotating blades at the interface between the low-speed compressor and the high-speed compressor where some advantage theoretically could be gained from counter rotation. Rather than teach the reader to so install such counter

rotating blade rows, Giffin, III et al as is shown in Figure 1, employ a stator. By employing a stator at the interface between the low-speed compressor and the high-speed compressor no advantage is gained. That Giffin, III et al do not teach this counter rotation makes patently clear that Giffin, III et al did not have an understanding of the concepts that comprise the present invention. Therefore it is impossible that there could be a teaching, disclosure or, even a suggestion, in Giffin, III et al that counter rotation in the *compressor* could provide any advantage one cannot teach what he does not know. Thus, the teaching of Giffin, III et al is inapposite to the present invention.

Another important distinguishing point with respect to Giffin, III et al is that the counter rotation that is taught in Giffin, III et al is extended to the low-pressure turbine that drives the fan. The turbine is multi-staged. While multi-staging with counter rotation is viable in a multi-staged turbine, where the peripheral speed of the rotating casing is limited by the tip speed limit on the fan blades, such multi-staging with counter rotation is not viable for a compressor. As far as it is understood by the prior art, counter rotation in a multistage turbine is workable due to the lower blade speeds and low-pressure ratio per stage. With respect to compressors, however, prior art understanding makes counter rotation contraindicated due to the high blade speeds and high pressure ratio per stage required. The discovery of the present invention allows counter rotation to be employed in the high speed high pressure environment of the compressor by combining counter rotation with boundary layer removal. The combination is synergistic and provides an unexpected result by making such a system much more efficient than would be expected of the individual parts of the

boundary layer removal and counter rotation even if *pro arguendo* they were known to be useful in compressors.

The Examiner admits that Giffin, III et al does not teach, disclose or suggest boundary layer removal, but the Examiner has not heretofore recognized that the counter rotation taught in Giffin, III et al is in the wrong type of machine. Even if Meauze provided sufficient teaching of boundary layer removal (which they do not) the combination thereof with the teaching of Giffin, III et al does not teach the claimed invention.

Notwithstanding the lack of a sufficient teaching in Giffin, III et al as the primary reference in the Examiner's rejection, the Examiner relies upon Meauze et al for its teaching of boundary layer removal. In order to be fully responsive to the Examiner's action, applicants note that Meauze et al addresses the use of boundary layer removal to minimize the effects of shocks at the tip of a super sonic compressor. As one of skill in the art will understand particular concepts relevant to a supersonic compressor do not necessarily translate to subsonic and transonic compressors. There is absolutely no teaching that the particular arrangement of Meauze et al relates to subsonic and transonic compressors. Therefore, there is no reasonable suggestion to one of ordinary skill in this art to combine the teaching with Giffin, III et al.

What Meauze et al teach is to remove the boundary layer at the tips of a supersonic compressor to reduce shock waves that are experienced in that location. There is no suggestion of other uses of boundary layer control nor how to make them functional and advantageous. Furthermore it is known to the art that turbines will not benefit from

boundary layer control. Why then would any one combine Meauze et al with Giffin, III et al?

In conclusion, Giffin, III et al teaches counter rotation in the wrong machine and Meauze teaches boundary layer control (only at the blade tips) in the wrong operating parameter. How then can it be possible for the present invention to be obvious over these references? Clearly it cannot. What might be gained or lost from a combination of these references is not known (and not likely to be known due to the art understanding that boundary layer control will not benefit a low-speed turbine) but certainly the combination does not yield the present invention.

The combination of boundary layer suction and counter rotation in the compressor is an extraordinary synergism never suggested before the present invention which results in the collapse of the compressor size by 50-70% compared to the prior art. The disclosure of the present invention is a significant advance for the art and deserving of the award of a patent. Applicant therefore respectfully requests withdrawal of the rejections and allowance of the application.

In the event the Examiner has queries regarding the instantly submitted response, applicant's attorney respectfully requests a telephone conference to discuss any matters in need of attention.

If there are any fees with respect to this paper or otherwise, please charge them to  
Deposit Account No. 06-1130, maintained by applicants' attorney.

Respectfully submitted,

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